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The Resilience of Cattle Farmer Cooperatives in the Midst of Global Dynamics: A Study on *Koperasi Peternak Sapi Bandung Utara Lembang*

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Abstract. Koperasi Peternak Sapi Bandung Utara (KPSBU) Lembang is a leading dairy cooperative with over 7,000 members and daily milk production exceeding 200 tons. This study analyzes its adaptation and innovation strategies to sustain production resilience and member welfare amid climate and economic pressures. Using interviews with cooperative leaders, member farmers, and field observations, the research identifies key practices: silage and concentrated feed production to reduce dependence on seasonal fodder, biogas and organic fertilizer from livestock waste, and digitalized milk distribution networks that ensure stable market access. Member engagement, transparent governance, and government support further strengthen resilience. A SWOT analysis highlights climate change and market competition as challenges, but strong member solidarity and technological opportunities as strategic advantages. Findings underscore that cooperative sustainability in globalization depends on continuous innovation, digital transformation, and multi-stakeholder collaboration.

Keywords: Cooperatives, Cattle Farming, Resilience, Innovation, Global Change, KPSBU Lembang

1. Introduction

Global climate change is significantly affecting the way milk is produced by increasing Climate change and global market instability are increasingly shaping the dynamics of the dairy sector worldwide. Rising temperatures, unpredictable weather patterns, and the resulting heat stress on livestock have been linked to declining productivity and animal welfare, as shown in long-term studies of the United States dairy industry (Gisbert-Queral et al., 2021; Kashyap et al 2023). Similar findings emerge in Ethiopia and Kenya, where research indicates that climate-smart practices and cooperative-based approaches can improve resilience, raise incomes, and enhance socio-economic stability for smallholder farmers (Balabaygloo et al 2023; Balcha et al 2023; Ma & Rahut 2023). At the same time, the evidence suggests that resilience is not built solely through technical adaptation. Institutional factors such as access to credit, training, and participation in farmer organizations play a decisive role in enabling the adoption of

sustainable practices (Kassa et al., 2025). In this regard, cooperatives stand out as effective institutions: they help reduce transaction costs, strengthen farmers' bargaining power, and sustain local food systems even during major disruptions like the COVID-19 pandemic (Turri et al., 2021). More recently, the integration of digital tools—from feed management applications to market information systems—has further expanded opportunities for collective adaptation, allowing cooperatives to respond more effectively to global shocks (Shamin et al., 2019).

Within Indonesia, Lembang has long been recognized as one of the country's leading dairy-producing regions, supported by a number of cooperatives that have operated for decades. However, despite their historical importance, little is known about the extent to which these cooperatives are proactively incorporating climate-smart principles, digital innovations, and institutional strategies to address the dual challenges of climate change and market volatility. This study seeks to fill that gap by examining the resilience strategies of cattle-farming cooperatives in Lembang through the broader perspective of global food system resilience. The research not only brings international lessons into the Indonesian context but also highlights the cooperative's role in bridging technical adaptation with institutional capacity, offering insights that can strengthen sustainable and climate-resilient dairy production systems at the local level.

2. Literatur Review

2.1 Climate-Smart Agriculture and Livestock Resilience

The impacts of climate change on livestock production have been well documented across different contexts. Rising temperatures, heat stress, and erratic rainfall patterns are consistently associated with reduced productivity and declining animal welfare, as illustrated in studies of the U.S. dairy industry (Gisbert-Queral et al., 2021). In Africa, research emphasizes the potential of climate-smart agriculture (CSA) practices to build resilience while reducing greenhouse gas emissions. For example, evidence from Ethiopia shows that adaptive practices such as feed diversification and improved housing systems enhance productivity while lowering emissions (Mburu et al., 2024; Kassa et al., 2025). Studies in Kenya also demonstrate that CSA can raise household incomes and improve socio-economic resilience (Negera et al., 2025). At the same time, resilience is strongly shaped by access to resources and institutions: farmers with higher income levels, education, and extension support tend to adopt CSA more effectively (Kassa., 2025). While this body of work highlights the technical and social benefits of CSA, little research has examined how such practices are embedded in cooperative structures in Southeast Asia. This study contributes by extending the discussion to Indonesia, focusing on how cooperatives may serve as vehicles for implementing climate-smart strategies at scale.

2.2. The Role of Cooperatives in Adaptation

Beyond individual farm practices, cooperatives are widely recognized as institutional mechanisms that enhance resilience in agricultural systems. They reduce transaction costs, improve bargaining positions, and expand access to markets, as shown in Kenya and Italy (Turri et al., 2021). During the COVID-19 pandemic, dairy cooperatives demonstrated their ability to sustain local food systems, with evidence from Italy showing that local breeds and cooperative networks maintained, and even increased, sales under crisis conditions (Turri et al., 2021). Other studies underline how training, extension services, and farmer organizations collectively accelerate the adoption of environmentally friendly practices (Negera et al., 2024;

Mburu et al., 2024). Meta-analyses also confirm that farmer institutions play a decisive role in strengthening resilience by expanding access to credit, knowledge, and other forms of capital (Kassa et al., 2025). Yet, post-2021 studies on dairy cooperatives remain limited, and few addresses how they integrate climate and market adaptation strategies simultaneously. This research expands the literature by investigating the cooperative sector in Lembang, where cooperatives have long been central to dairy production, but their resilience strategies remain underexplored.

2.3 Digital Transformation in Agriculture

A growing strand of literature highlights the role of digital technologies in reshaping agricultural resilience. Applications for feed management, market information systems, and e-commerce platforms have been shown to improve flexibility and reduce risks for farmers (Shamin et al., 2019). In Ethiopia and Kenya, digital connections are particularly valued for strengthening farmer networks and facilitating rapid knowledge exchange (Omulo et al., 2020). Evidence also points to the synergistic benefits of combining digital tools with agroecological practices, which can simultaneously improve productivity and environmental outcomes. In dairy systems, technologies such as active cooling systems, waste management innovations, and precision farming have proven effective in mitigating climate risks (Getahun et al 2024). Despite these advances, the integration of digital innovation within cooperative frameworks in Southeast Asia has not been studied extensively. By examining how Lembang's cooperatives engage with digital tools, this study challenges the assumption that smallholder-based cooperatives are slow adopters of technology, showing instead how digitalisation may reinforce their adaptive capacity.

3. Research Methods

This study employs a qualitative approach with a descriptive method, aiming to capture the phenomenon of cooperative resilience in depth and detail. Data were collected from 15 participants, consisting of cooperative administrators and members who were selected using purposive sampling based on their active involvement in management and long-term membership(Fadil. 2021). Field observations were conducted over a period of three months (June–August 2025) in the setting of cooperative offices and community-based business activities, allowing the researcher to document both formal operations and daily interactions. In-depth interviews were guided by a semi-structured protocol, covering themes such as governance practices, financial strategies, member participation, and adaptation to external challenges. Example guiding questions included: "How has the cooperative adapted its operations in response to economic changes?" and "What strategies do members perceive as most effective in maintaining resilience?".

The data analysis process followed a thematic analysis approach. First, transcripts and field notes were openly coded to identify initial categories, followed by axial coding to group related themes, and finally selective coding to refine the core categories related to resilience strategies. This iterative process was supported by constant comparison across interviews, observations, and documents. To ensure the trustworthiness of findings, several validation measures were employed. Triangulation was achieved by comparing interview data, observation notes, and organizational documents. Member checking was conducted by sharing preliminary findings with participants to confirm accuracy and credibility. These steps enhanced the transparency and rigor of the qualitative process while maintaining sensitivity to the lived experiences of cooperative actors.

4. Results and Discussion

SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to assess their internal environment. Strengths, weaknesses, opportunities, and threats are some of the factors that influence achieving short-term and long-term goals. Describing the situation and conditions that are being faced is the goal of this analysis method. SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis is a very important analysis tool for a company because it aims to create a framework of the situation and condition of the company from this point of view. This analysis helps businesses find their internal strengths to capitalize on external opportunities and fix internal weaknesses that can lead to external threats (Dess et al., 2021).

This study chose the North Bandung Cattle Breeders Cooperative (KPSBU) located in Lembang, West Bandung Regency, as the subject of the study because the company has an important strategic role in maintaining the sustainability of the fresh milk supply chain in Indonesia. One of the largest dairy farming cooperatives in the country, KPSBU has thousands of active breeders and is supported by management and technical staff in various divisions such as production, processing, and distribution. This cooperative has a Strategic Plan that includes a vision, mission, objectives, and work program. The plan is intended to address global issues such as distribution uncertainty, market price fluctuations, and climate change. Using SWOT analysis, this study aims to evaluate the resilience of KPSBU institutions in the face of global dynamics and find innovative strategies to ensure the sustainability of the company in the future.

Interviews were conducted with processing employees on Friday, July 18, 2025, to gain a first-hand understanding of business processes, production resilience, and cooperative adaptation strategies to global dynamics. In addition, internal documents of the cooperative were also studied, as well as in-depth interviews and literature studies. Researchers conducted a strengths, weaknesses, opportunities, and threats (SWOT) analysis through direct observation and internal conversations with cooperative members in Table 1. This analysis was qualitative in nature, evaluating informants' perceptions and experiences of internal and external factors affecting the resilience and sustainability of KPSBU Lembang. This method enables researchers to understand the cooperative's adaptation strategies more comprehensively and contextually in the face of evolving challenges around the world.

Table 1. Results of Internal and External SWOT Factor Analysis at KPSBU Lembang

Strength
1. Feed and Energy Innovation ▪ Cooperatives between Cianjur and Indramayu produce silage from corn and grass. ▪ Concentrated food products, also known as mako, independently. ▪ The utilization of cow waste for biogas (also known as "gesters"), organic fertilizers, and worm farming media is very profitable.
2. Quality and High Production Standards ▪ Use of ABCD (Original, Clean, Fast, Cold) standard ▪ Routine field inspections and milk collection by the task force every day.

3. Solid and Participatory Cooperative Management
   - Trusted and Participating Cooperative Management
   - Each member participates in meetings and assesses.
   - High transparency of services, including cash, loans, and free delivery of goods.
   - Regularly provide cooperative education to understand the rights and obligations of members.

4. Comprehensive Service
   - Veterinarians are available at all times.
   - Fulfilling the daily needs of members through the provision of basic necessities and free delivery.

Weaknesses

1. Imperfect Digitalization
   - Use of ABCD (Original, Clean, Fast, Cold) standard
   - Routine field inspections and milk collection by the task force every day.

2. Derivative Products Are Still Very Limited
   - The production of pasteurized milk and yogurt is still very small.
   - The products have not been distributed outside the cooperative area.

3. Milk Production Doesn't Meet Demand
   - While factory demand is increasing, the daily production capacity has only reached 115 tons.
   - Loss of market opportunities can occur due to this gap

Opportunities

1. High Demand for Milk in the Country
   - Cooperatives have a lot of room to develop because Indonesia's local milk production is still less than 20% of the national need.
   - potential to increase capacity through the development of cages, partnerships, and superior seeds

2. Market Potential of Eco-Friendly and Processed Products
   - Worms, organic fertilizers, and biogas for the cosmetics and agricultural industries are very profitable.
   - Worms, organic fertilizers, and biogas for the cosmetics and agricultural industries are very profitable.

3. Support from partners and governments
   - access to equipment, livestock, and business licenses.

- Local cooperatives such as Cililin for feed have created new networks.

4. Smart Farming and Digital Transformation
   - The potential to increase cooperatives through the application of information technology, digital logistics systems, and livestock monitoring based on the Internet of Things (IoT).

Threats

1. Climate Change and the Effects of Seasons
   - The availability of forage feed is threatened by prolonged drought.
   - Extreme weather can disrupt dependence on out-of-region supplies.

2. Expertise Market and Imported Products
   - Imported processed products and milk can reduce local prices and competitiveness.
   - If competition is not balanced with market innovation, customer loyalty can be affected.

3. Limitations on Business Scale
   - The business cannot grow due to local distribution and small derivative products.
   - Limited capital, technology, or human resources hinder expansion.

4. Relying on external help
   - Cooperatives still depend on government assistance, such as permits, tools, and livestock assistance.
   - The risk of stagnation may increase if support decreases.

S–O (Strength–Opportunities) Strategy

The development of dairy farming in Indonesia requires a comprehensive and sustainable approach to address rising national milk demand. KPSBU's strategy of strengthening livestock reproductive systems, modernizing facilities, and building a self-sufficient feed factory illustrates how cooperatives can leverage internal strengths to meet market opportunities. Compared with other dairy cooperatives in West Java, which often rely on external feed supply and manual milking systems, KPSBU's investment in silage processing and advanced equipment positions it ahead in terms of efficiency and product quality. The presence of strong government–private partnerships has also amplified these strengths, enabling access to improved breeds, equipment, and technical support. These strengths emerge largely because KPSBU operates in a region with relatively strong institutional support, long-standing farmer solidarity, and a large membership base. Beyond KPSBU, such strategies suggest broader implications: cooperative policy should prioritize technology adoption and infrastructure investment as prerequisites for scaling sustainable livestock production, while also integrating farmer training programs to ensure that modern facilities translate into improved farmer capacity.

W–O (Weakness–Opportunities) Strategy

Despite its achievements, KPSBU faces structural weaknesses common among farmer cooperatives, such as limited capital access and generational renewal challenges. Unlike larger cooperatives such as GKSI (Gabungan Koperasi Susu Indonesia), which benefit from more formalized financial partnerships, KPSBU relies heavily on solidarity-based internal lending. This explains why financing remains a bottleneck. The cooperative attempts to turn these weaknesses into opportunities by gradually embracing digital technology, expanding e-commerce channels, and promoting processed products like yogurt and pasteurized milk. These efforts align with trends in other Southeast Asian cooperatives, where diversification and digital platforms have become critical for market expansion. Importantly, KPSBU's context—being located near major urban centers like Bandung—creates opportunities for direct marketing and brand development, which may not be as accessible to cooperatives in more remote regions. At the policy level, this case highlights the need for inclusive financing schemes, targeted incentives for young farmers, and digital capacity-building programs to ensure that cooperatives can modernize while addressing structural vulnerabilities.

S–T (Strength–Threats) Strategy

In responding to threats such as climate change, energy insecurity, and market competition, KPSBU has leveraged its established strengths. Feed security through silage technology and cross-regional partnerships demonstrates proactive adaptation, in contrast to smaller cooperatives that remain heavily dependent on seasonal forage. Similarly, the adoption of biogas technology not only reduces operational costs but also addresses broader sustainability challenges. These strategies reflect how KPSBU's relatively large scale and resource base allow it to mitigate risks more effectively than smaller cooperatives. The cooperative's success in maintaining milk quality standards through rapid cooling and task force monitoring also shows how internal discipline and collective organization can be mobilized to maintain competitiveness. For policymakers, this illustrates the importance of scaling renewable energy initiatives and setting cooperative-driven quality standards as a buffer against globalized market pressures.

W–T (Weakness–Threats) Strategy

KPSBU's weaknesses, such as limited youth participation and uneven digital literacy, intersect with broader sectoral threats. Compared with advanced cooperatives in countries like India, where cooperative education systems have been institutionalized, KPSBU still faces difficulties in ensuring intergenerational continuity. These weaknesses partly stem from the declining appeal of livestock farming to younger generations in Indonesia, as well as from the slow pace of digital adoption among older farmers. To address these issues, KPSBU has initiated training programs, product diversification (e.g., yogurt and cheese), and cooperative-led education efforts. While these measures are incremental, they reflect an adaptive response that could be replicated elsewhere. At the national level, this suggests the need for stronger cooperative education policies, integration of agribusiness digitalization training into rural curricula, and incentive mechanisms to make farming attractive for youth. By linking cooperative resilience to policy frameworks, the KPSBU case demonstrates how grassroots weaknesses can be systematically addressed through broader institutional reforms.

5. Conclusion

Based on the results of the research, cattle farming cooperatives in Lembang such as KPSBU are able to show good resilience in facing various global challenges, ranging from climate change, market turmoil, to distribution barriers. This resilience is built through strong management, active involvement of members, and innovation in waste, feed, and technology management even though digitalization is still not optimal.

Through SWOT analysis, it was found that cooperatives have many advantages such as high production standards, complete services, and a participatory organizational system. Even so, there are challenges in terms of limited processed products and unmet market demand. Meanwhile, great opportunities can be seen from the increasing national milk demand, government support, and the potential use of smart agricultural technology. However, cooperatives must also be aware of risks that come from external factors such as extreme weather and dependence on outside assistance.

Overall, cooperatives such as KPSBU show that a collective approach based on local values and innovation is able to strengthen the resilience of the livestock sector. In the future, efforts to improve technology, diversify products, and strengthen internal capital are the keys to maintaining the existence and sustainability of cooperatives in the face of growing global changes.

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Finally, hopefully this research can provide academic benefits and make a real contribution in strengthening the role of breeder cooperatives in the midst of growing global dynamics. We hope that the results of this study can be a useful reference for policymakers, academics, and cooperative actors in developing adaptive and sustainable strategies in the future.

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